Fingerprint Recognition of Newborns Baby

PROPOSAL

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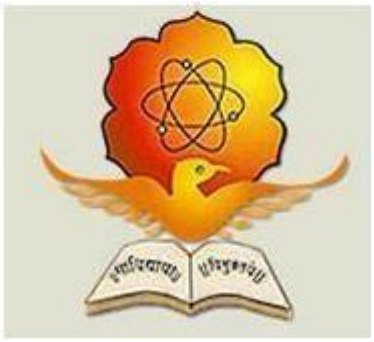

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ABSTRACT

Newborns abduction, swapping, missing, illegal adoptions and kidnapping are increasing issues in the hospitals, birthing centers, health centers and in other places where multiple births occur simultaneously.

A biometric system using the fingerprint of the newborn is proposed to overcome such issues. Consider authentication and identification of infants and toddlers is a major challenge in various organizations.

Fingerprint recognition system works well in authenticating and identifying the adults. However, in case of infants and toddlers, it faces the challenges like low quality of fingerprint images and improper enrollment, and thus reducing the recognition accuracy.

In this work, we will develop a fingerprint recognition algorithm with emphasis on feature extraction for the automatic recognition of newborns and infants.

Keywords—

Biometrics, Fingerprint recognition, Newborn, Identification, Infants, toddlers

1- INTRODUCTION

In 1899, Sir Francis Galton [1] first examined the distinctions contained in an infant's inked fingerprint impressions captured over time (from about 9 days to 4.5 years of age). He concluded that it was not possible to recognize children using inked fingerprint impressions in the age group of 0-2.5 years.

More recently, the European Commission's Joint Research Center released a scientific report [2] on whether automatic fingerprint identification for children is feasible or not.

The study concluded that when the time gap between the two recorded impressions is less than 4.5 years, I children can be detected using fingerprints, and picture accuracy is a deciding factor in fingerprint identification. The effect of adolescent growth on the precision of fingerprint matching systems was studied by Gottschlich et al. [3] and found that I fingerprint growth can be modeled.

Using an isotropic growth model, and by scaling the fingerprint images using this model while comparing adolescent fingerprint images obtained over time, the matching accuracy of fingerprint systems can be increased.

Figure (1) Some Newborns with Fingerprints them of the Republic of India (19)

In order to address the question of individual identity, biometric authentication has been extensively studied for several decades. Many of the methods in a wide variety of civil and forensic applications have been successfully deployed. Almost all of the strategies, though, are intended for adults or juveniles, not for children. These techniques may not be useful for infants directly since some of the biometric modalities, e.g. face, are not stable shortly after birth for the purpose of automatic recognition.

The most precise means of infant identification is supposed to be DNA (except in the case of identical twins). However, owing to the inconvenience of sample capture, the existing DNA-based identification approach is not appropriate for real-time use and can also be perceived as an invasive technique. In addition, certain privacy issues may be posed by the use of DNA.

In recent years, several works were conducted to analyze the suitability of using fingerprints in children.

2- LITRETURE OF REVIEW

There are several works related to this research..

Jain et al developed recognition software for toddlers and infants[4]. The software was contrasted with the SDK for commercial fingerprint recognition. The proposed software has increased efficiency but has found some challenges that the resultant precision significantly affects the consistency of the image as well as the state of the finger surface. This issue makes it impossible for the fingerprint to retrieve features.

A new fingerprint matching system [5] was suggested by Aroraetal. They recommended an excellent latent feature for the extraction and matching of latent features to increase recognition efficiency.

Schumacher [6] contrasts three fingerprint recognition commercial SDKs, Bozorth, Vendor 1, and Vendor 2, of which three commercial SDKs are used to process fingerprints for babies and toddlers.

The child ageing effect on fingerprint recognition accuracy was studied by Gottschlich et al.[7]. Using an isotropic growth mechanism that is used to improve the precision of fingerprint matching, they have modelled the growth of fingerprints.

The influence of children's age on various hand-based recognition mechanisms such as Finger, Thumb, Hand-geometry and Digitprint has been investigated by Andreas et al.[8]. In addition, the success effect of the role and the example level are evaluated depending on various age groups. In the case of fingerprint and palm printing, they found poorer outcomes for the 3-10 age range. Geometry features will, however, offer better output outcomes for the same age group. Furthermore, the characteristics of the 19+ age group will produce positive performance outcomes.

[9] Graph-based matching [10] and string-based matching [11] The minutiae-based matching technique has been commonly used in fingerprint matching. Minutiae are extracted from the fingerprint images here, and matching is done depending on the position of the minutiae. Matching can be unsuccessful in the case of two separate positions of minute points and hence involves adequate pre-processing and post-processing of photographs to derive

accurate characteristics. Moreover, it does not take into account critical fingerprint details.

For fingerprint detection, the filter bank based fingerprint matching algorithm [12] applies the filter bank [13]. Here, by considering eight directions, the Gabor filter [14] is used to extract local and global fingerprint knowledge. The reference point and area of interest in the given fingerprint are first defined by this algorithm. With the aid of Gabor filters, it gives the area of interest in eight directions so that local ridge features and global fingerprint configuration can be captured [15]. The average absolute deviation is then determined by taking into account the mean of grey values in each field, which is specified as finger code (feature vector code). The Euclidean distance method refers to the stored finger code and the finger code for matching checks.

Jain et al.[15] conducted the extraction of minutiae by upsampling the fingerprints. Here, for enhanced results, the survey fingerprint is compared with the fingerprint templates obtained during registration and matching scores of the thumb and index finger are merged.

A fingerprint database of 66 babies in India was created by Jain et al. [16]. In their function, an image enhancement algorithm is developed and using commercially available schemes, features are extracted and paired.

3- TECHNOLOGIES

Biometric technologies are described as "automated processes for authenticating or distinguishing the uniqueness of a living person on the basis of physiological or behavioural characteristics."

A system for scanning and capturing a digital or analogue image of a living personal feature, encoding, processing and image comparison with a recorded image database and application systems interface.

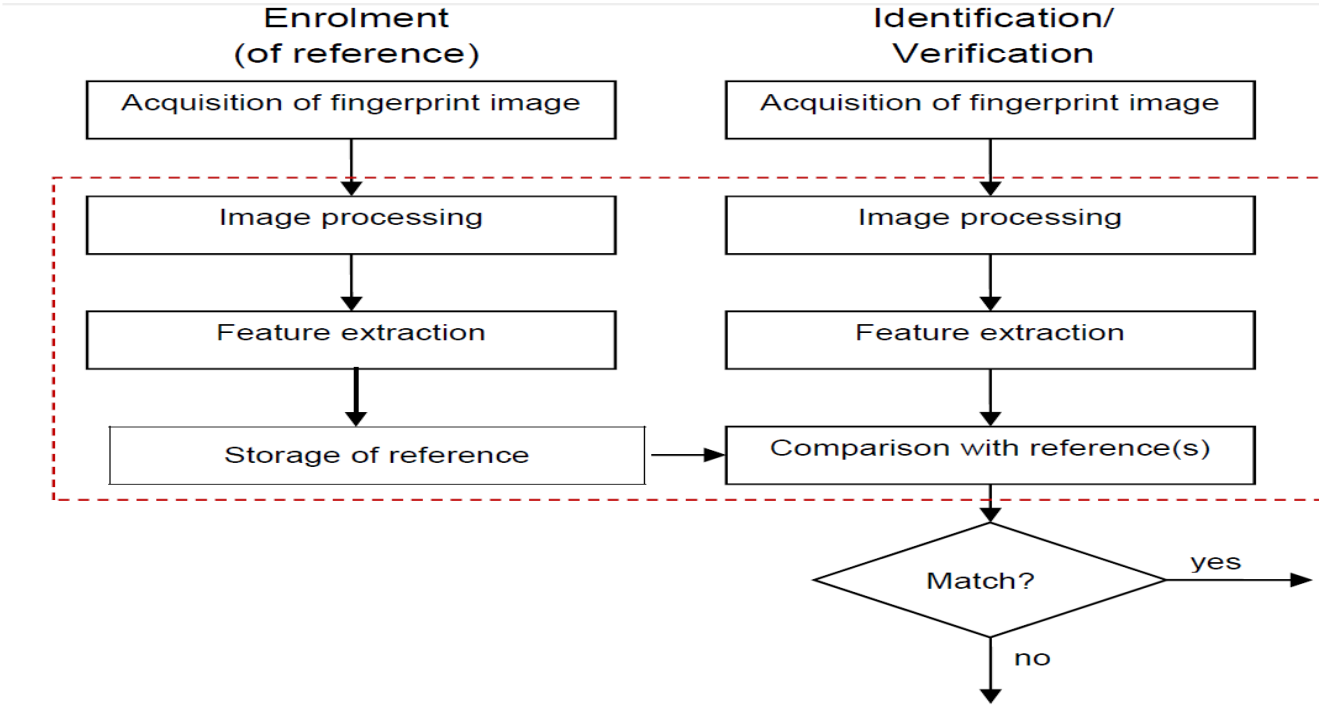

Figure (2) stages common framework for Fingerprint recognition [20]

4- SIGNIFICANCE OF THE STUDY

The shortage of security precautions in hospitals and intensive care facilities is largely due to this. Many cases of baby swapping, hospital kidnapping and incorrect transfers of newborns have been registered.

Gray et al [17] have researched that in the US, 50 percent (out of 34) of newborn babies could be misrecognized.

Many cases of baby kidnapping and unlawful adoption have been registered in China [18]. To resolve these concerns for newborn infants, an appropriate mechanism must be created that can classify children and keep track of the vaccines issued.

In the univocal identification of individuals, the DNA test is known to be successful, but it comes at high costs and requirements.

Therefore, in real-time implementations, advanced laboratory techniques cannot be used. Therefore, the present study aims to incorporate new intelligent methods using principles of artificial intelligence to build a fingerprint recognition system that is critical for personal authentication of newborns, as it is a non-invasive method of simple applicability, low cost, broad acceptance.

Figure (3) Models of those who have been identified (19)

5- STATEMENT OF THE PROBLEM

Our aim is create system low cost solution to the newborn violence rather than the expensive DNA procedure and demands sophisticated laboratory procedures.

To solve problems related to birth record, baby exchange and vaccination.

6- OBJECTIVES AND CHALLENGES

The purpose of the proposed identification system is to authenticate the infants and toddlers securely and reliably, based on their fingerprints.

We seek for create Integrated system (Stable over time), uniqueness (Distinct for each person), ergonomic, low cost (Accessible to all), lifelong usability, Portability and acceptability.

There challenges in Infant Fingerprint Recognition the most important:

• Motion blur and image distortion

• Small finger size

• Dry/wet/dirty fingers

• Small inter-ridge spacing (4-5 pixels) vs. (9-10 pixels) for adults.

7- RESEARCH METHODLOGY

1) Use a fingerprint sensor to collect the fingerprints of newborns and babies or take them using scanner a digital camera.

2) Adding to the obtained fingerprints the required pre-processing algorithm.

3) Development of a versatile algorithm to extract features pre-processed fingerprint functionality.

4) Merging an appropriate matching algorithm and decision making unit with the proposed feature extraction algorithm to create a comprehensive fingerprint recognition system.

5) Suggested recognition system testing with performance appraisal of any programm language using FAL and FRFF.

6) Comparative performance study of the proposed framework for fingerprint recognition and current systems for fingerprint recognition.

8- PROPOSED PLAN

Business plan of the year and objectives to be achieved :

Year 1:

- Literature Survey.
- Theoretical analysis of the existing different schemes already used for feature selection.

Year 2:

- Developing scheme for feature selection.
- Describes an application of presented a new scheme of feature selection.
- Assessment of experimental results in terms of recognition rate.

Year 3:

- Interpretation of the experimental result.
- create the practical system of thesis .

Year 4:

- Preparation of final synopsis and thesis.
- Submission of synopsis and thesis.

9- REFERENCES

[1] F. Galton. Finger prints of young children. *British Association for the Advancement of Science*, 1899.

[2] Fingerprint recognition for children. Technical report, Institute for the Protection and Security of the Citizen, 2013. http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/29732/1/fingerprint

[3] C. Gottschlich, T. Hotz, R. Lorenz, S. Bernhardt, M. Hantschel, and A. Munk. Modeling the growth of fingerprints improves matching for adolescents. *IEEE Transactions on Information Forensics and Security*, 6(3):1165–1169, Sept 2011.

[4] Jain, Arora, and Kai. "Recognizing Infants and Toddlers Using Fingerprints: Increasing the Vaccination Coverage". Proceeding of the International Joint Conference of Biometrics (IJCB), 29 Sept – 2 Oct 2014 Clearwater Florida.

[5] Wang, Zhen, et al. "Child-trafficking networks of illegal adoption in China." *Nature Sustainability* 1.5 (2018): 254-260.

[6] Schumacher, Günter. *Fingerprint recognition for children*. EUR-OP, 2013.

[7] Gottschlich, Carsten, et al. "Modeling the growth of fingerprints improves matching for adolescents." *IEEE Transactions on Information Forensics and Security* 6.3 (2011): 1165-1169.

[8] Uhl, Andreas, and Peter Wild. "Comparing verification performance of kids and adults for fingerprint, palmprint, hand-geometry and digitprint biometrics." *2009 IEEE 3rd International Conference on Biometrics: Theory, Applications, and Systems*. IEEE, 2009.

[9] Jain, Anil K., et al. "An identity-authentication system using fingerprints." *Proceedings of the IEEE* 85.9 (1997): 1365-1388.

[10] Hrechak, Andrew K., and James A. McHugh. "Automated fingerprint recognition using structural matching." *Pattern Recognition* 23.8 (1990): 893-904.

[11] Ratha, Nalini K., et al. "A real-time matching system for large fingerprint databases." *IEEE transactions on pattern analysis and machine intelligence* 18.8 (1996): 799-813.

[12] Jain, Anil K., et al. "Filterbank-based fingerprint matching." *IEEE transactions on Image Processing* 9.5 (2000): 846-859.

[13] Eshera, M., and K. S. Fu. "A similarity measure between attributed relational graphs for image analysis." *Proc. 7th Int. Conf. Pattern Recognition*. 1984.

[14] Yang, Jianwei, et al. "A modified Gabor filter design method for fingerprint image enhancement." *Pattern Recognition Letters* 24.12 (2003): 1805-1817.

[15] Jain, Anil K., Kai Cao, and Sunpreet S. Arora. "Recognizing infants and toddlers using fingerprints: Increasing the vaccination coverage." *IEEE International Joint Conference on Biometrics*. IEEE, 2014.

[16] Image Analysis and Biometrics Lab @ IIIT Delhi. [Online.] Available: http://www.iab-rubric.org/resources.html

[17] Gray, James E., et al. "Patient misidentification in the neonatal intensive care unit: quantification of risk." *Pediatrics* 117.1 (2006): e43-e47.

[18] Illegal adoption. [Online.] Avaialable: https://www.unric.org/en/humantrafficking/27450-illegal-adoption?format=pdf

[19] https://www.id4africa.com/2019_event/presentations/InF15/1-Joshua-Engelsma-MSU.pdf

[20] Beslay, L., J. Galbally, and R. Haraksim. *Automatic fingerprint recognition: from children to elderly*. Technical report, Joint Research Center, 2018

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